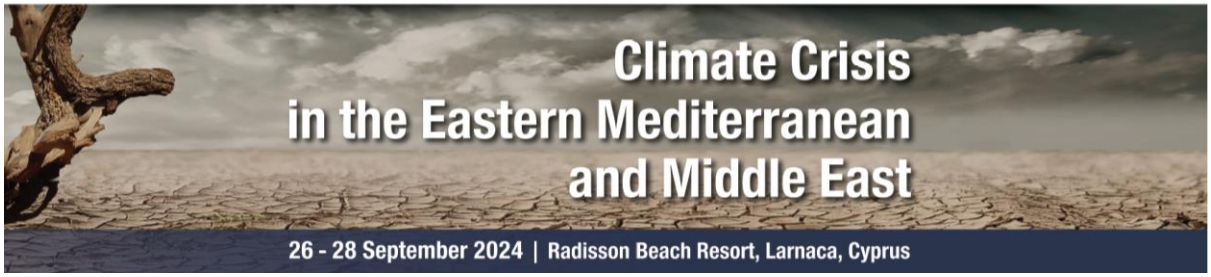

POSTER ABSTRACTS - INDEX

IAS-1

VEClim - an early warning support system for climate-sensitive vector-borne diseases

Kamil Erguler[1,*], Ahmet Arca[1], George Tsouloupas[2], George Christophides[1,3], Jos Lelieveld[1,4]

[1]Climate and Atmosphere Research Centre (CARE-C), The Cyprus Institute, Nicosia, Cyprus
[2]High-Performance Computing Facility, The Cyprus Institute, Nicosia, Cyprus
[3]Department of Life Sciences, Imperial College London, London SW7 2AZ, UK
[4]Max Planck Institute for Chemistry, Mainz 55128, Germany
[*]Presenting author. Email address: k.erguler@cyi.ac.cy

The Climate-Driven Vector-Borne Disease Risk Assessment project (VEClim), supported by the Wellcome Trust as part of Digital Technology Development Awards in Climate-Sensitive Infectious Disease Modelling, aims to improve vector-borne disease prediction and management by employing data-driven, mechanistic, and climate-sensitive geographical modelling to represent vector populations and disease transmission. The VEClim platform features a user-friendly web-based GIS designed as a versatile interface to improve accessibility to the models and to present short-, medium, and long-term predictions of habitat suitability, vector activity, and disease risk and impact. The platform displays vector presence and risk maps and seasonal profiles of vector activity and disease risk. It is planned to include (i) an extensive database of meteorological variables, climate projections, and environmental covariates and (ii) an up-to-date longitudinal vector surveillance dataset. Customised simulations under different climate scenarios and vector control activities will also be possible. A comprehensive application programming interface (API) will extend the capacity of advanced data analysis tools, such as Python and R, to accommodate climate-sensitive mechanistic modelling. The platform is operationally maintained at The Cyprus Institute and is permanently available via its dedicated domain: veclim.com.

IAS-2

Health Impacts of Extreme Temperature Events: A Mortality and Hospitalization Study in Cyprus (2004-2019)

Fragkeskos Kekkou[1,*], Theo Economou[1], Georgia Lazoglou[1], Christina Anagnostopoulou[1]

[1]The Cyprus Institute, Nicosia, Cyprus
[*]Presenting author. Email address: f.kekkou@cyi.ac.cy

In Mediterranean regions like Cyprus, extreme summer heatwaves are increasingly common due to anthropogenic climate change. Though less frequent, cold waves also pose significant health risks. Studies show higher mortality during cold weather, particularly in warmer southern European cities compared to northern ones. Extreme temperatures heighten bio-climatic stress, adversely affecting human health by disrupting physiological functions and exacerbating preexisting conditions, leading to discomfort, severe illnesses, and even mortality.

Using ERA5-Land reanalysis data, we identified extreme temperature events from 2000 to 2019 by analysing maximum and minimum daily temperatures for both the warm (May-Oct) and cold (Nov-Apr) seasons. Extreme hot days were those where both maximum and minimum temperatures were above the 95th percentile of monthly values during the warm season, while extreme cold days were those where both temperatures fell below the 5th percentile during the cold season. Statistical and machine learning methods, including Distributed Lag Models (DLMs) and Generalized Additive Models (GAMs), were employed to estimate mortality and hospitalizations risks using health statistics from the Ministry of Health and Statistical Service in Cyprus.

We found increased mortality risks for both high and low temperature extremes. However, hospitalization risks were generally lower and peaked at lower temperatures. Lower temperatures generally posed more significant health risks than higher temperatures. We also determined optimal temperatures associated with lower risk and quantified the attributable fraction of deaths and hospitalizations for extreme temperature days and events lasting two or more consecutive days. Our findings revealed that deaths and hospitalizations were significantly higher during cold periods compared to warm periods. In contrast, the increase in attributable deaths during extreme high temperatures was greater than the increase during cold periods when compared to non-extreme days.

IAS-3

Climate Change Challenges for the Agrifood Sector: Impacts and Future Directions

Ioana Panait[1,*]

[1]The Bucharest University of Economic Studies, Bucharest, Romania
[*]Presenting author. Email address: panaitioana48@gmail.com

Climate change poses significant challenges to the agrifood sector, affecting food security, agricultural productivity, and rural livelihoods. This paper examines the multifaceted impacts of climate change on the agrifood system, including alterations in crop yields, shifts in growing seasons, and increased vulnerability to pests and diseases. Additionally, it explores the socioeconomic implications, particularly for smallholder farmers in developing regions. The paper also discusses adaptive strategies, such as climate-smart agriculture, sustainable resource management, and policy interventions, aimed at mitigating these impacts. This study employs a mixed-methods approach to investigate the impacts of climate change on the agrifood sector and identify potential adaptive strategies. Quantitative data is gathered from climate models, crop yield projections, and socioeconomic indicators to assess the extent of climate change's effects on agricultural productivity and food security. Additionally, qualitative methods, including case studies and stakeholder interviews, provide insights into the experiences and adaptive responses of farmers, particularly in vulnerable regions. The study also reviews existing literature on climate-smart agriculture and sustainable practices. By integrating these methods, the research aims to provide a comprehensive understanding of the challenges faced by the agrifood sector and inform future policy and adaptation strategies. Future directions for research and policy are proposed, emphasizing the need for an integrated, multidisciplinary approach to ensure the resilience and sustainability of the agrifood sector in a changing climate.

IAS-4

Climate Agreements as a Foundation of Peace

Bar Rapaport[1,*]

[1]Mitvim – The Israeli Institute for Regional Foreign Policies, Israel
[*]Presenting author. Email address: brapaport@mitvim.org.il

The climate crisis transcends political boundaries, affecting neighboring countries that share common resources. This makes cross-border cooperation essential for addressing extreme climate events. Collaborative efforts can include creating regional renewable energy grids, exchanging renewable energy generated in desert areas for desalinated water, designating cross-border marine reserves, establishing interstate support mechanisms for climate disasters, creating joint research centers to combat desertification, cultivating food in border areas, protecting shared water sources, and confronting epidemics. Some of these collaborative projects are already underway worldwide, while others are in their early stages. However, cooperation between countries can be challenging, especially in regions mired in political conflict. The climate crisis, which is altering and shrinking existing resources, could lead either to isolation and competition for dwindling resources or to cooperation that overcomes political difficulties.

This paper aims to present guiding principles for addressing both the climate crisis and political conflict, demonstrating how tackling one challenge can help manage the other. Drawing from knowledge and experience in the Middle East and beyond, the document outlines key principles for designing climate agreements that also promote peacebuilding. These principles include: increasing existing resources rather than merely distributing them, examining political and social scenarios resulting from environmental cooperation agreements, using agreements to create social norms and values, building a shared knowledge infrastructure, balancing power during negotiations, incorporating local and regional aspects of the conflict and agreement, relying on international conventions, and planning for a "spillover" effect into other sectors. These principles are globally applicable and particularly relevant to promoting peace in the Israeli-Palestinian context.

IAS-5

Transforming Tourism Food Supply under a Changing Climate: Initial Insights from Cyprus

Evridiki Panayi[1,*],Florentios Economou[1], Elias Giannakis[1,2], Christos Zoumides[1]

[1]The Cyprus Institute, Nicosia, Cyprus
[2]Agricultural University of Athens, Athens, Greece
[*]Presenting author. Email address: e.panayi@cyi.ac.cy

Climate change poses significant challenges to the Eastern Mediterranean region, a premier tourist destination that hosted over 100 million visitors in 2019. Rising temperatures, prolonged heat waves, and shifting seasons threaten the region's popularity, particularly during the summer months. In addition to these direct impacts, the tourism sector contributes indirectly to environmental degradation and biodiversity loss, particularly through its impact on food supply. Increased tourism demand for food and biomass production can lead to adverse land-use changes, greater resource consumption, and higher greenhouse gas emissions. With limited relocation options and the prospect of prolonged drought periods in the near future, the available food supply and local food production are expected to face further demand-supply divergence, with shifts in seasonal patterns, reduced crop yields, diminished product quality, and weakened ecosystem resilience. In the face of these challenges, the tourism sector holds significant potential to mitigate its impacts. By adopting food waste management practices, promoting dietary shifts towards more plant-based options, supporting sustainable local production, and improving the efficiency of food trade and supply chains, the sector can contribute to transformative change. Such efforts will not only help preserve the region's attractiveness as a tourist destination but also contribute to global climate change mitigation and to multiple sustainable development goals. Effective collaboration among various stakeholders is critical for implementing these solutions and safeguarding the Mediterranean's natural and cultural heritage. This study presents initial qualitative insights derived from surveys and semi-structured interviews, exploring tourists' food consumption patterns and the perceptions and practices of Cyprus's hospitality sector. These interim results offer a preliminary understanding of the challenges and opportunities in promoting sustainable food practices within the tourism sector. Further findings will be available in the coming year, incorporating quantitative analyses, modeling approaches, and transformative pathways that account for the food and biomass nexus between climate action, production, trade, consumption, and human behavior, as part of the EU-funded RAINFORST project.

IAS-6

Detection of Usutu Virus and *Culex pipiens molestus* in targeted mosquito surveillance collections from Cyprus

Aayushi A. Sharma[1,2,*] , Marco Neira[1], Angeliki F. Martinou[3], Daniel Cadar[4], Michalis Omirou[5], George K. Christophides[1,2]

[1]The Cyprus Institute, Nicosia, Cyprus;
[2]Imperial College London, London, UK
[3]Joint Services Health Unit, British Forces Cyprus, Limassol, Cyprus
[4]Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany
[5]Agricultural Research Institute, Nicosia, Cyprus
[*]Presenting author. Email address: aayushi.sharma17@imperial.ac.uk

Urbanisation, globalisation and climate change have facilitated the widespread expansion of mosquito populations and the diseases they carry into new geographic areas such as the Eastern Mediterranean and Middle East region. Cyprus, which is located on the flyover pathway for several migratory birds, has established populations of appropriate mosquito vectors, experienced outbreaks of West Nile virus (WNV) and seen the recent introduction of the invasive Aedes mosquitoes. Given the evolving climatic factors prevalent in the region and plasticity of the ecological and epidemiological landscapes, the necessity of having routine comprehensive surveillance programmes to monitor medically significant pathogens has become increasingly evident. To overcome the logistical challenges of large-scale mosquito monitoring, targeted surveillance efforts were carried out in two cities of Cyprus between 2019 and 2022. The local mosquito fauna was identified through morphological analysis, while molecular techniques were employed to determine the biotypes of *Culex pipiens* mosquitoes. Additionally, the midguts of engorged mosquitoes were analysed to identify host blood meals, and several mosquito pools were screened for arboviruses using metagenomic next-generation sequencing. The results reveal the presence of Usutu virus (USUV) in one pool of *Cx. pipiens* mosquitoes. Moreover, the study demonstrated the presence of *Cx. pipiens pipiens, Cx. pipiens molestus*, and their hybrids in these localities. Furthermore, several host blood meals were identified from engorged guts including the bird Cettis warbler, which has previously been shown to be seropositive for WNV in the country. Given the presence of the human biting *Cx. pipiens* and the hybrids that can act as bridge vectors, as well as the first report of USUV in a pool of *Cx. pipiens* mosquitoes, this study emphasises an increased risk of arbovirus transmission in Cyprus.

LEGAL AND CONSTITUTIONAL ISSUES (LCI)

LCI-1

The Prospects for a Regional Climate Forum in the Middle East

Bar Rapaport[1,*], Shira Efrom[2]

[1]Mitvim – The Israeli Institute for Regional Foreign Policies, Israel
[2]Israel Policy Forum, Israel
[*]Presenting author. Email address: brapaport@mitvim.org.il

This paper examines the prospects for establishing a regional multilateral forum to help address climate change in the Middle East. The document defines the constructs of forums, analyzes the characteristics of various regional forums around the world, and discusses the pros and cons of such frameworks in general, and their relevance to Israel, in particular. The paper also describes opportunities for leveraging existing policy structures in the Middle East to enhance transboundary climate cooperation, presents new ideas for such regional cooperation, and points out the barriers to such an endeavor.

Although such a forum would require substantial investment by each country and increase interdependencies, its advantages would outweigh its disadvantages. Specifically, a regional forum could become a direct communication channel between countries, strengthen cooperation, improve environmental resilience and, indirectly, regional stability. insights and recommendations includes (1) Capitalizing existing regional frameworks to advance practical steps, (2)Supporting civil society and looking for success stories, (3)Transitioning from "the people shall dwell alone" state of mind into regional integration (4) Interlink the resolution of the Israeli-Palestinian conflict to a regional integration.

MITIGATION STRATEGIES: THE CHALLENGE TO DECARBONIZING THE REGIONAL ECONOMY (MSC)

MSC-1

From a Fossil-Fuel-Intensive to a Material-Intensive Energy System: The Impact of the Green Energy Transition from a Circular Economy Perspective

Ulku Tasseven[1,*], Theodoros Zachariadis[1], Georgia Savvidou[2], Qiu Liu[2], Filip Johnson[2]

[1]The Cyprus Institute, Cyprus
[2]Chalmers University of Technology, Sweden
[*]Presenting author. Email address: u.tasseven@cyi.ac.cy

The dominant role of solar systems in reaching the net-zero emissions target is expected to increase in the coming years, particularly in regions such as southern Europe and Eastern Mediterranean and Middle East with favourable solar conditions. The anticipated increase in PV capacity raises concerns about the ability of material supply chains to meet the escalating demand for raw materials used for manufacturing and installation of this technology. Nevertheless, installed systems has the potential to supply secondary materials if circular economy practices are placed. We provide a national study, by investigating Cyprus – A European Union (EU) member state for which solar PV is a key technology for reaching a carbon free electricity system. Using Material Flow Analysis, we evaluate three transition scenarios (Business as Usual, With Existing Measures, Net-Zero Scenario) to assess the impacts of different policy and investment strategies on the material requirements of PV systems on the island. Compared to baseline, our findings indicate a six-fold increase in demand for materials under the Net Zero Scenario. Results also suggests that four out of five materials that are categorised as either critical or strategically important by the EU (aluminium, copper, silicon, gallium, and germanium) are showings self-sufficiency towards 2050 through potential circular practices. Emphasising the substantial potential for secondary material recovery post-2050, we explore the volumes for each material relevant to PV technology and their flow trends. By bridging technical material analysis and policy recommendations, this research highlights the necessity of enhancing secondary material recovery and strategic material management of PV systems to support sustainable energy transitions in the region.

MSC-2

Concentrating Solar Thermal Energy as a Substitute of Fossil Fuels in Dairy Industry

Giorgos Papakokkinos[1,*], Alaric Montenon[1], Petros Petrou[2], Maria Papadimitriou[2]

[1] The Cyprus Institute, Nicosia, Cyprus
[2] Petrou Bros Dairy Products, Larnaca, Cyprus
[*]Presenting author. Email address: g.papakokkinos@cyi.ac.cy

According to the International Energy Agency, the industrial energy consumption represents 37% of the total global energy consumption. Approximately 66% of this industrial consumption is in the form of heat, which currently is predominantly produced by fossil fuel combustion, resulting to the associated greenhouse gases emissions. A significant portion of the heat demand (temperatures below 400°C) can be satisfied by concentrating solar thermal technologies, such as Linear Fresnel Reflectors (LFR). Within the framework of STS-MED project, the Cyprus Institute (CyI) implemented on its premises the first LFR system in Cyprus, which is operational and provides heat for space heating and cooling. Within the ongoing INDHEAP project, the CyI studies the possibility of incorporating an LFR in a local dairy industry, Petrou Bros Dairy Products (PBDP). PBDP covers half of its thermal energy demand using biogas that is produced in-situ, by valorizing whey, a liquid organic residual that arises from their own cheese production. Although the latter practice is highly sustainable and circular, the other half thermal demand is covered by Light Fuel Oil (LFO), a fuel with high carbon-intensity. The incorporation of the LFR aims to reduce the LFO consumption. Annual transient computational studies were conducted using the open tool OpenModelica, considering the performance of a commercial LFR system. Within the available surface area, the LFR system that can be employed pertains to 368m2 and 488m2 of mirrors and ground surface area, respectively. The simulations involve the climatic data of Larnaca, the location of the PBDP factory. The annual heat delivered by the solar system is calculated as 302200 kWh. The latter would avoid the purchase and combustion of 29135 kg of LFO per year. Consequently, the carbon emissions avoidance is estimated to 91435 kgCO2 equivalent per year, while the monetary savings are at least 26656€ per year.

OMP-1

Precipitation Projections and Variability Changes in the North Africa Region Based on the CMIP6 Ensemble

Andreas Karpasitis[1,*], George Zittis[1]

[1]The Cyprus Institute, Nicosia, Cyprus
[*]Presenting author. Email address: a.karpasitis@cyi.ac.cy

The North Africa region is a hot and arid region, with sparse water resources. This climate and environmental hot spot is expected to be heavily impacted by changes in precipitation patterns as a result of global warming. Despite the overall trends, future rainfall projections are dominated by high uncertainty, while, in addition, changes in extremes and variability have not been extensively assessed. Here, we analyzed a multi-model ensemble of CMIP6 projections, to study how the total and extreme precipitation is expected to change in the future compared to a recent-past reference period. For providing a range of possible futures, we used two different scenarios, SSP2-4.5 and SSP5-8.5. Our findings corroborate a decline in precipitation for the coastal regions of North Africa, while the CMIP6 models indicate an increase in extreme precipitation events over these areas. Moreover, the models show an increase in year-to-year variability in the Mediterranean coast of North Africa. These findings highlight the need for better quantification of the increased rainfall variability and the additional challenges it poses to water resources, agriculture, and ecosystems.

OMP-2

Parameterizing Robust Hydrologic Models for Climate Impact Assessments - Insights in the 2030-2060 Water Resources Future for Cyprus

Ioannis Sofokleous[1,*], Adriana Bruggeman[1], George Zittis[2], Gerald Dörflinger[3]

[1]Energy, Environment and Water Research Centre - The Cyprus Institute, Cyprus
[2]Climate and Atmosphere Research Centre - The Cyprus Institute, Cyprus
[3]Water Development Department, Nicosia, Cyprus
[*]Presenting author. Email address: i.sofokleous@cyi.ac.cy

Regional climate models (RCMs) project a continuous warming and drying of the Mediterranean until at least the end of the century. The changes in these climate variables impact freshwater resources, which need to be quantified through climate impact studies. The objectives of this study are: (i) to develop a method for selecting a robust hydrological model parameterization for climate impact assessment of water resources and (ii) to assess streamflow projections until 2060. The study focuses on Cyprus, an island in the Eastern Mediterranean, and covers 38 mountain watersheds. The GR4J hydrological model was calibrated using seven different optimization functions for various sub-periods within the 1980–2015 period. Temperature and precipitation data from 19 bias-corrected RCMs were downscaled at 1-km spatial resolution for the 2030–2060 period. These downscaled data were used to simulate streamflow with the GR4J model. Our results indicate a variable climate change signal in bias-corrected and downscaled precipitation, ranging from no change to a reduction of over 15%. These reductions were amplified in the streamflow simulated for the future period. The findings suggest that terrestrial water resources may significantly deteriorate in the coming decades, emphasizing the need for prioritizing water-saving measures and efficient resource management.
This research was supported by the PREVENT project that has received funding from the EU Horizon Europe framework programme (grant no. 101081276) and the 3PRO-TROODOS Project (INTEGRATED/0609/061), which was co-financed by the European Regional Development Fund and the Republic of Cyprus through the Cyprus Research and Innovation Foundation.

OMP-3

Adapting To Climate Change with Sustainable Terrace Agriculture: Integrating Aerial Surveying, Hydrogeological and Slope Stability Modelling

Aman Kumar Meena[1,*], Adriana Bruggeman[1], Hakan Djuma[1], Christos Zoumides[1], Federica Lucini[2], Corrado A.S. Camera[2]

[1]The Cyprus Institute, Nicosia, Cyprus
[2]Università degli Studi di Milano, Milan, Italy
[*]Presenting author. Email address: a.meena@cyi.ac.cy

In the context of changing climate in the Eastern Mediterranean, the cooler temperatures and higher rainfall of mountain environments in comparison to plains, presents potential advantages for agricultural production. This research aims to support sustainable terrace agriculture in Mediterranean mountain environments. The construction of mountain terraces with dry-stone walls and sloping risers mostly relies on traditional knowledge. The objectives of this research are: i) to apply aerial surveys and Structure-from-Motion (SfM) photogrammetry and monitor slope failures in agricultural mountain terraces; and ii) to assess the stability of terraced slopes using a process-based modelling approach. A terraced site in Oikos community in the Troodos Mountains of Cyprus, dedicated to grape cultivation for wine making, was selected for this study. A survey with an Unmanned Aerial Vehicle (UAV) was conducted to capture images of the area. These images were processed using the SfM technique to generate digital elevation models and terrain maps. Field assessments and sampling were performed to determine the hydrogeological, mechanical and geometrical properties of the terraces and supporting dry-stone walls. These parameters were incorporated into a slope stability model to evaluate the factor of safety under different moisture conditions. Additional UAV-based surveys will be conducted to capture different rainfall events damaging the terraces. A process-based hydrological model will used to analyse soil moisture dynamics of damaging rainfall events at the study site. The obtained data will be used as input for improving the parametrization of the slope stability model simulations. This study demonstrates the effectiveness of integrating UAV surveys and process-based models to monitor and analyse potential terrace failures, contributing to hydrologically robust design and the sustainability of mountain terraces.

OMP-4

-Poster withdrawn by author's request-

OMP-5

Integrating UAV-Based In-Situ and Ground-Based Remote Sensing Observations for Enhanced Aerosol Profiling

Alkistis Papetta[1,*], Maria Kezoudi[1], Alexandra Tsekeri[2], Chris Stopford[3], Troy Thornberry[4], Jean Sciare[1], Franco Marenco[1]

[1]Climate and Atmosphere Research Center, The Cyprus Institute, Nicosia, Cyprus
[2]Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing, National Observatory of Athens, Athens, Greece
[3]Centre for Atmospheric and Climate Physics, University of Hertfordshire, Hatfield AL10 9EU, UK
[4]National Oceanic Atmospheric Administration (NOAA), Boulder, CO 80305, USA
[*]Presenting author. Email address: a.papetta@cyi.ac.cy

This study explores the integration of Unmanned Aerial Vehicle (UAV)-based in-situ aerosol particle size distributions (PSD) with ground-based remote sensing techniques to estimate columnar PSDs and vertically resolved aerosol concentrations. Understanding aerosol vertical distribution is crucial for assessing their radiative impact on the atmosphere and cloud interactions. Ground-based lidar-photometer setups provide simultaneous information on aerosol properties, offering complementary insights. Typically, vertically resolved aerosol concentrations are derived from aerosol extinction using an inversion parameter, the effective radius, derived from PSD measurements.

The study uses UAVs equipped with Optical Particle Counters (OPCs) and impactors to collect high-altitude aerosol samples. These UAVs operate near co-located lidar and sunphotometers at the Unmanned Systems Research Laboratory (USRL) of The Cyprus Institute (CYI). Three atmospheric campaigns in Cyprus, Cape Verde, and Greece, targeting diverse aerosol compositions and atmospheric conditions, provide a comprehensive dataset for evaluation. The goal is to link in-situ and remote sensing methods using scattering computations and retrieval algorithms.

Preliminary results from the Fall Campaign in Cyprus reveal that UAV-based PSDs showed higher particle concentrations in the 1 to 10 μm range during a dust episode compared to AERONET retrievals. This disparity likely influences the resulting concentrations from the lidar, as larger particles significantly contribute to mass concentration and extinction, affecting the effective radius and, consequently, the conversion between extinction and mass.

The study aims to leverage UAV-based high-altitude observations and lidar profiles to improve understanding of aerosol properties at different atmospheric layers, addressing remote-sensing biases, uncertainties, and the reliance on assumptions.

OMP-6

Effects of Climate Change on Environmental Suitability for Dairy Cattle: Predictions from a High-Resolution Analysis

Marco Neira[1,†,*], Pantelis Georgiades[1,†], Theo Economou[1,2] , Yiannis Proestos[1], José Arraya[1], Stavros Malas[3], Jos Lelieveld[1,4]

[1]Climate and Atmosphere Research Center (CARE-C), The Cyprus Institute, Nicosia, Cyprus
[2]Mathematics and Statistics Department, University of Exeter, UK
[3]The Cyprus Institute, Nicosia, Cyprus
[4]The Max Planck Institute for Chemistry, Mainz, Germany
[†]Authors contributed equally to this work
[*]Presenting author. Email address: m.neira@cyi.ac.cy

Dairy farming, a vital sector of the agricultural industry, is notably sensitive to environmental conditions, with a significant portion of the sector's economic losses being attributable to heat stress. The susceptibility of dairy cattle to climate change is related to environmental factors (particularly temperature and humidity) and biological parameters, such as breed, age, etc. The Temperature-Humidity Index (THI) is a non-invasive measure, commonly used to estimate the combined effects of temperature and humidity on the physiology of dairy cattle. THI thresholds for specific physiological effects (e.g. changes in milk yield, mortality risk, etc.) are well documented in the scientific literature.

We compiled a high-resolution dataset by employing the hourly meteorological reanalysis ERA5 global data (1980-2018) to train a machine-learning model to downscale daily climate projections to hourly THI values. The validated model was used to downscale daily climate projection data from 12 NEX-GDDP-CMIP6 climate models for the years 2020-2100, considering two greenhouse gas emission scenarios (Shared Socioeconomic Pathways 2-4.5 and 5-8.5, respectively). Based on widely applicable THI thresholds for mild and severe thermal stress, we estimated projected future stress duration (hours above threshold) and intensity (THI load above threshold) on a global scale, and produced estimates for mid-century (2020 to 2050) and late-century (2070-2100) periods.

By developing a model capable of global THI calculations with fine temporal and spatial resolution, we identify regions where expected shifts in environmental parameters are likely to create particularly challenging conditions for dairy cattle in the future, hence requiring the implementation of specific adaptation measures.

OMP-7

Statistical Downscaling of the CMIP6 Models to the urban scale: Case Study for Athens, Greece, within the Framework of the CLIMPACT project

Konstantina Koutroumanou-Kontosi[1,2,*], Constantinos Cartalis[2], Panos Hadjinicolaou[1], Konstantinos Philippopoulos[2], Ilias Agathangelidis[2]

[1]Climate and Atmosphere Research Center (CARE-C), The Cyprus Institute, 2121 Nicosia, Cyprus;
[2]Department of Physics, National and Kapodistrian University of Athens, 15784 Athens, Greece;
[*]Presenting author. Email address: E-mail: k.koutroumanou@cyi.ac.cy

The Eastern Mediterranean and Middle East (EMME) region is experiencing rapidly accelerating warming, with models projecting more frequent, intense and long-lasting heatwaves. This poses a significant threat to cities in the area, increasing their vulnerability to heat risk. However, the spatial resolution of Global Climate Models (GCMs) is insufficient for accurately assessing the urban thermal environment. To address this, either dynamical downscaling (DD), which relies on physical schemes, or empirical/statistical downscaling (ESD), based on extracting statistical relationships, can be employed. In this study, we apply the ESD technique due to its computational efficiency for long-term simulations, to downscale 2m air temperature over Athens, Greece. Advanced machine learning techniques are employed to derive statistical relationships between the global and the local scales with spatial horizontal resolutions of 100km×100km and 1km×1km respectively. For the global scale, CMIP6 model outputs are utilized, while for the local scale, a database derived from the UrbClim model is used. The ESD is applied for various CMIP6 models under different Shared Socioeconomic Pathways (SSPs) scenarios for both historical and future periods. The simulation results are evaluated against observation data from ten meteorological stations, and a comparative analysis is conducted between the historical and future periods to assess changes in the urban thermal environment.

PLANS FOR MITIGATION AND ADAPTATION OF RELEVANCE TO THE EMME REGION (PMA)

PMA-1

Sustainably Cooling Eastern Med and Middle Eastern Cities

V. Litskas[1,*], K. Drystella[1], P. Vasquez-Hadjilyra[2], N. Parmaxis[2], M. Santamouris[1,4], S. Vryonidi[3], and Thanasis Hadzilacos[1,*]

[1]The Cyprus Institute; 20 Konstantinou Kavafi Street, 2121, Lefkosia, Cyprus
[2]Lemesos Municipality, Arch. Kyprianos 23, 3036, Lemesos, Cyprus
[3]Friends of the Earth Cyprus, A. Andreou 361, 3032, Lemesos, Cyprus
[4]University New South Wales, Sydney Australia
[*]Presenting author. Email address: t.hadzilacos@cyi.ac.cy

Lemesos is one of the 100 EU cities of the Climate Neutral and Smart Cities by 2030 Mission Program of the EU, targeting GHG emissions neutrality by 2030, 20 years earlier than the EU target. The Lemesos Climate City Challenge (Lc3 - https://lc3-nzlimassol2030.eu/en/, financed by the Mission) is the first of several hundred projects needed to transform the city to mitigate and adapt to climate change in an inclusive and fair transition. LC3's overarching objective is to pilot innovative ways for reducing greenhouse gas emissions due to cooling buildings. This is approached by reducing the ambient temperature targeting urban heat islands, by increasing building energy efficiency using cool materials and by local clean energy production in small and very small spaces like rooftops, parking spaces, bus stops, and pedestrian streets. Lc3 activities are structured around participatory solutions co-design workshops and the establishment of the Lemesos Commons, a dynamic collaborative body and platform for integrating solutions and fostering collaboration among diverse stakeholders. Participants from these workshops are expected to become agents of change changing social attitude towards the climate crisis by promoting the implementation of climate action strategies. By leveraging the urban living lab approach, Lc3 fosters an environment of continuous innovation and real-life testing of sustainable urban solutions. Moreover, Lc3 activities are inclusive, targeting broad citizen engagement and the involvement of marginalized groups to ensure a just transition. Through these comprehensive activities, Lc3 aims to create a scalable and transferable model for other cities, contributing significantly to global climate change mitigation efforts while transforming Lemesos into a sustainable and resilient smart city.

PMA-2

Monitoring Climate Change Impact at Hypogeum Heritage Sites with 3D Technologies - The Example of the Shatby (Alexandria, Egypt) Necropolis

Athanasios Koutoupas[1,*] , Rahaf Orabi[1], Sorin Hermon[1], Nikolas Bakirtzis[1]

[1]The Cyprus Institute, Nicosia, Cyprus
[*]Presenting author. Email address: a.koutoupas@cyi.ac.cy

The cemetery complex at Shatby, Alexandria began its existence with the foundation of the Hellenistic city in the 4th century B.C.E. It consists of dug into the bedrock burial chambers with once richly decorated walls, carved columns and false doors, evidencing for the importance of its buried individuals, probably belonging to the elites of the Alexandrian city. Excavated at the beginning of the 20th century and since then abandoned, the site is now vitalised and opened to the public following massive interventions that cleaned the area, consolidated the walls and created a comprehensive site management plan, thanks to the Alexandrian Necropolis Project, run by the Archaeological Society of Alexandria. The APAC Labs team of the Cyprus Institute conducted a comprehensive 3D documentation of the site, in order to create a digital twin aimed at capturing the current conservation conditions at the site and create a monitoring system of its architectural features, frescoes decorations and other remains. The poster will present the 3D documentation workflow and its results.

OTH-1

AI-Based Generative Design of Concentrated Solar Thermal Collectors

Jorge Moreno García-Moreno[1,*], Kypros Milidonis[1], Wojciech Lipinski[1]

[1]The Cyprus Institute, Nicosia, Cyprus
[*]Presenting author. Email address: j.moreno@cyi.ac.cy

Artificial intelligence (AI) is aiding the transformation of the renewable energy industry towards enhanced efficiency, reduced costs, and improved reliability. Key areas of the renewable energy sector benefitting from the use of AI-based methods are resource forecasting, demand prediction, and device and system design, integration and operation. The concurrent contemporary increase in accessibility of high-performance computing (HPC) resources enables the deployment of large-scale, data-intensive AI-based methods. In the context of engineering design and optimisation, AI and generative design (GD) are closely connected through their synergistic capabilities, with AI significantly augmenting the generative design process, enabling intelligent decision-making and creation of innovative, efficient, and highly-performing designs. In this work, an AI-based generative design methodology is developed and applied to engineering design and optimisation of critical components of concentrated solar thermal (CST) energy systems, the concentrating solar thermal collectors. The methodology comprises geometry parametrisation, optical evaluation, and AI-based geometrical refinement of initial designs under consideration. In the first stage of the study, the methodology is used to optimise geometrical design of solar cavity receivers for solar tower systems and of secondary reflectors for linearly-focusing concentrating collectors. The approach developed offers several advantages over the traditional ones, including its ability to generate unconventional, non-intuitive and efficient receiver designs in an automated manner, which are often not conceived by traditional design approaches. The methodology presented in this work can readily be extended to study other elements of concentrating solar thermal systems such as polar and surround heliostat fields, multi-stage solar concentrators, and integrated concentrator–receiver collectors.

OTH-2

A Digital-Twin Approach for Climate Change Risk-Assessment at UNESCO World Heritage Sites - The St. John Lampadistis Monastery in Cyprus as a Case Study

Valentina Vassallo[1], Anastasia Tsagka[1], Nikolas Bakirtzis[1], Sorin Hermon[1]

[1]The Cyprus Institute, Nicosia, Cyprus
[*]Presenting author. Email address: v.vassallo@cyi.ac.cy

Assessing the potential negative impacts of climate change on Cultural Heritage sites is a challenging endeavour, due to various factors that have to be taken into consideration, due to the their complexity. The poster will present a workflow for documenting heritage sites, with a particular focus on built UNESCO World Heritage sites, that aims to gather data useful for assessing risks associated with climate change impacts. Such a documentation strategy must be related to an assessment of the contribution of various hazards, both anthropogenic and natural, active at the heritage site and its surroundings, The documentation strategy and related data integration must cover tangible and intangible aspects of the heritage sites, within its natural and anthropic environment and to build on local communities engagement and multi-disciplinary research.

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